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(71) Applicant (*for all designated States except US*): HYDRO-NAUTIC SERVICES [NL/NL]; Driftstraat 63, NL-2315 CD Leiden (NL).

(72) Inventor; and
(75) Inventor/Applicant (*for US only*): VAN DE MEIDE, Hans [NL/NL]; Driftstraat 63, NL-2315 CD Leiden (NL).

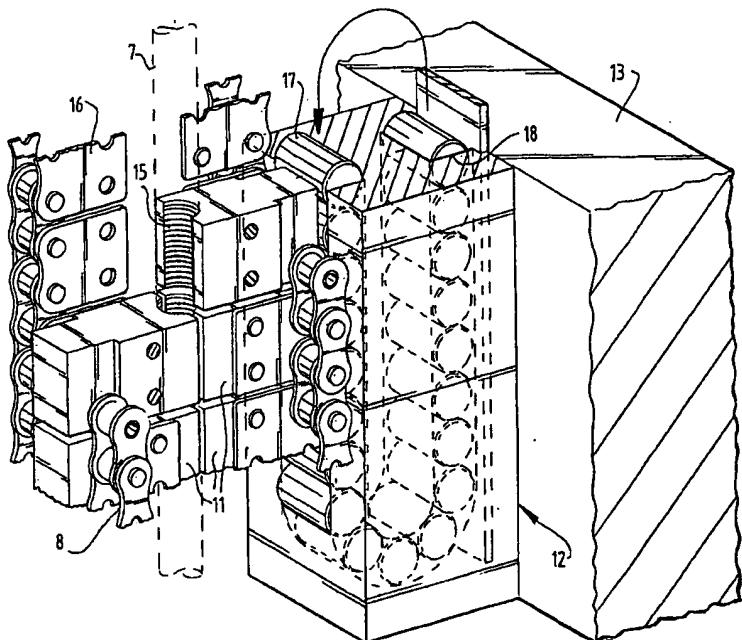
(74) Agent: 'T JONG, Bastiaan, Jacobus; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).

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(54) Title: INJECTOR USED FOR TUBING OR COILED TUBING



(57) Abstract

Device for driving a rigid elongate element such as a rod or tube in its longitudinal direction, comprising a frame, at least two engaging systems arranged on the frame which each comprise an endless flexible member provided with engaging elements and guide means for guiding each of the endless members, wherein the guide means of each system are arranged such that they define a part of the endless flexible member in which the engaging elements co-act with those in a corresponding co-acting part of another system, and drive means for driving at least one of the endless members.

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INJECTOR USED FOR TUBING OR COILED TUBING

The invention relates to a device for driving in its longitudinal direction, i.e. moving by pulling or pushing, a rigid elongate element such as a rod or tube. Such a device is applied for instance in soil analysis. A probe is then fixed to an end of the rod or tube and driven into the ground using the device. During driving into the ground the encountered resistance is measured by the probe and transmitted to a recording device. The nature of the ground can thus be established and it can for instance be determined at which depth in the ground good bearing layers are situated.

In known devices of this type the elongate element is assembled from separate pipe parts. These are driven into the ground using a hydraulic jack. When one pipe part has been driven into the ground, a subsequent pipe part is screwed on top thereof and the driving-in operation can be repeated. This continues thus until the assembled pipe has been driven to the desired depth into the ground. Removal takes place in reverse manner.

The use of separate pipe elements makes use of the device time-consuming. Devices are indeed known for obviating this drawback wherein use is made of a rigid elongate element such as a rod or tube in one piece, which is wound onto a large diameter. Driving of this elongate element into the ground takes place with wheel sets, which engage on both sides of the elongate element and drive it clampingly therebetween. The pressure on the elongate element must be great to enable sufficient force to be produced. This entails the drawback of a heavy and bulky construction to be able to absorb the forces to be generated, as well as the danger of damage to the rigid elongate element.

The invention has for its object to provide a device of the type stated in the preamble which can be embodied compactly and with which a rigid elongate

element such as a rod or tube can be driven in its longitudinal direction in reliable manner.

This objective is achieved in the device according to the invention as characterized in claim 1.

5 The engagement on the elongate element by the engaging elements takes place over a considerable length, so that the contact pressure can remain limited. The device can hereby take a light and compact form, while the risk of the deformation of the rod or tube is extremely small.

10 The force on the elongate element can be dosed precisely by applying the measure of claim 2.

Both measures of claim 3 are preferably applied. The means by which the force is generated for operation of the engaging systems can herein be separated 15 from those with which the elongate element is driven, thus enabling an effective construction of the device.

A simple embodiment is characterized in claim 4. According to a further development the measure of claim 5 is applied. Via the guide rollers a considerable 20 force can be exerted on the parts of the endless flexible members without this entailing considerable frictional losses.

An advantageous further development is herein characterized in claim 6. By incorporating the guide 25 rollers in a circuit, these do not have to be separately mounted, so that a construction is obtained which is simpler and less susceptible to malfunction.

In order to obtain a good engagement of the engaging elements on the rigid elongate element, the 30 measure of claim 7 is preferably applied. The recesses can herein be dimensioned such that they fit closely onto the rigid elongate element, whereby a good clamping and driving-engagement is obtained.

In order to enhance the engagement the measure 35 of claim 8 is advantageously applied.

A suitable embodiment is characterized in claim 9. The chain can transmit considerable forces and forms herein a good means for mounting the engaging elements.

The flexible member is herein embodied in suitable manner with two chains situated mutually adjacently at a distance, wherein the engaging elements are arranged between these chains. The urging means can 5 then engage on the engaging elements in simple manner without the force having to be transmitted via the flexible member.

The invention will be further elucidated in the following description with reference to the annexed 10 figures, in which embodiments are shown.

Fig. 1 shows a partly broken away perspective view of a device according to a preferred embodiment of the invention;

Fig. 2 shows a partly broken away perspective 15 detail view as according to arrow II in fig. 1;

Fig. 3 shows a view partly corresponding with fig. 2 of an alternative embodiment;

Fig. 4 and 5 show different embodiment variants 20 of chains as used in preferred embodiments of the invention;

Fig. 6 shows a schematic side view of a device according to the invention in the situation of use.

The device 1 shown in fig. 1 comprises a main frame 2 in which two sub-frames 3 and 4 are moveably 25 enclosed. These sub-frames 3, 4 can be moved toward and away from each other using hydraulic cylinders 6 which are connected on one side to frame 2 and on the other to one of the sub-frames 3, 4.

Each sub-frame 3, 4 comprises an engaging 30 system 5 which each comprise an endless flexible member in the form of a double chain 8 provided with engaging elements 11. Each double chain 8 is trained round a number of chain wheels 9 such that a vertical part is defined in each case between two chain wheels situated 35 one above the other.

These corresponding vertical parts of sub-frames 3, 4 lie opposite each other such that the engaging elements 11 thereof can co-act for clamping

therebetween of a rigid elongate element 7 in the form of a long rod or tube. Connected to one of the chain wheels 9 in each case is a drive 10 which can drive the assembly of chains 8 and engaging elements 11 such that engaging elements 11 are moved downward respectively upward in the vertical parts. Because engaging elements 11 therein engage the rod or tube 7, this latter is herein driven vertically upward or downward.

Device 1 is further provided with urging means 12 which can urge toward each other the co-acting vertical parts of chains 8 and the engaging elements connected thereto. These urging means 12 comprise pressure plates 13 on both sides of the vertical chain parts which are mutually coupled by means of hydraulic cylinders 12 on either side. By feeding hydraulic cylinders 12 with hydraulic oil under pressure such that the piston rod in the cylinder is pulled inward, pressure blocks 13 are urged toward each other and the chain parts and engaging elements 11 are herein also urged toward each other, therein firmly clamping rod or tube 7. For release of the urging means cylinders 12 are loaded in the opposite direction, whereby the pressure on the parts is removed. Sub-frames 3, 4 can then be moved apart with cylinders 6, wherein rod or tube 7 is released.

The operation of the urging means is further elucidated with reference to fig. 2, which shows a preferred embodiment.

Fig. 2 shows the co-acting engaging elements 11 of the opposing parts of the two engaging systems. As is clearly shown here, each engaging element 11 is provided with a recess 15 which is provided with additional transverse grooves in order to enable a good firm engagement on rod or tube 7.

As already noted, chain 8 is preferably embodied here as a double chain wherein engaging elements 11 are arranged in each case between these chains. Each chain of the double chain is provided with plates 16 which are connected to engaging elements 11.

Engaging elements 11 lie with their side remote from recess 15 against the urging means, which are provided in this embodiment with guide rollers 17. These guide rollers 17 are arranged in a circuit 18. When a force is thus exerted on engaging elements 11 by pressure block 13 via rollers 17, these latter will on one side roll over the rear side of engaging elements 11 and on the other side over the bottom of the circuit groove located opposite, so that a very slight friction occurs against the relative movement between the engaging elements and pressure block 13.

The force with which engaging elements 11 are pressed against rod or tube 7 depends on the driving by means of driving devices 10.

Fig. 3 shows an alternative embodiment of urging means 12. The force of the pressure block (not shown here) is herein transmitted via bearing mounted rollers 20. These lie with the peripheral surface against the rear side of engaging elements 11 and thus enable pushing of engaging elements 11 in the direction of rod or tube 7, while these can still move in longitudinal direction along urging means 12.

Fig. 4 and 5 show different embodiments of chains for use with the device according to the invention. Each link is provided with protruding plates 16, in which are formed holes 22 on which engaging elements 11 can be arranged.

The device of fig. 1 is light and compact and can be suitably arranged on for instance the lifting means of a tractor in order to enable manoeuvring herewith in suitable manner on the land. Anywhere where it is desired to carry out for instance a soil-drilling test the tractor can lower the device onto the ground, whereafter the rod or tube can be driven into the ground.

Another option for use is depicted in fig. 6. Device 1 is herein accommodated in a hoist frame 30 and on device 1 is constructed a magazine 31 in which rod or tube 7 can be stored in rolled-up form. In order to bring

and keep rod or tube 7 in the rolled-up form, magazine 31 is provided with a number of guide rollers 32. Rod or tube 7 can be driven into the ground from the rolled-up state by device 1 and also pulled therefrom again and 5 returned to the rolled-up state.

It is noted that the invention is not limited to the embodiments shown in the figures. It is thus not necessary to apply two engaging systems. Three or four may also be used. Nor is it necessary for each of the 10 driving systems to have its own drive. One driven driving system can usually suffice, wherein the other driving system(s) co-displace with the driven system. The urging means can also be embodied in different ways. Some possibilities are already shown in the figures. However, 15 the invention is not limited thereto.

The application of the device described here is not limited to soil-drilling tests. The device can for instance also be used in suitable manner for inserting an earth electrode. Another application is in the laying of 20 cables through pipes. The maximum length of a cable which can be arranged through a pipe depends partly on the force with which the cable can be pushed inside the pipe from the entrance thereof. This is usually carried out using manpower. By using a device according to the 25 invention a considerably greater pushing force can be exerted, whereby the piece of cable to be placed through a pipe at one time can be considerably longer.

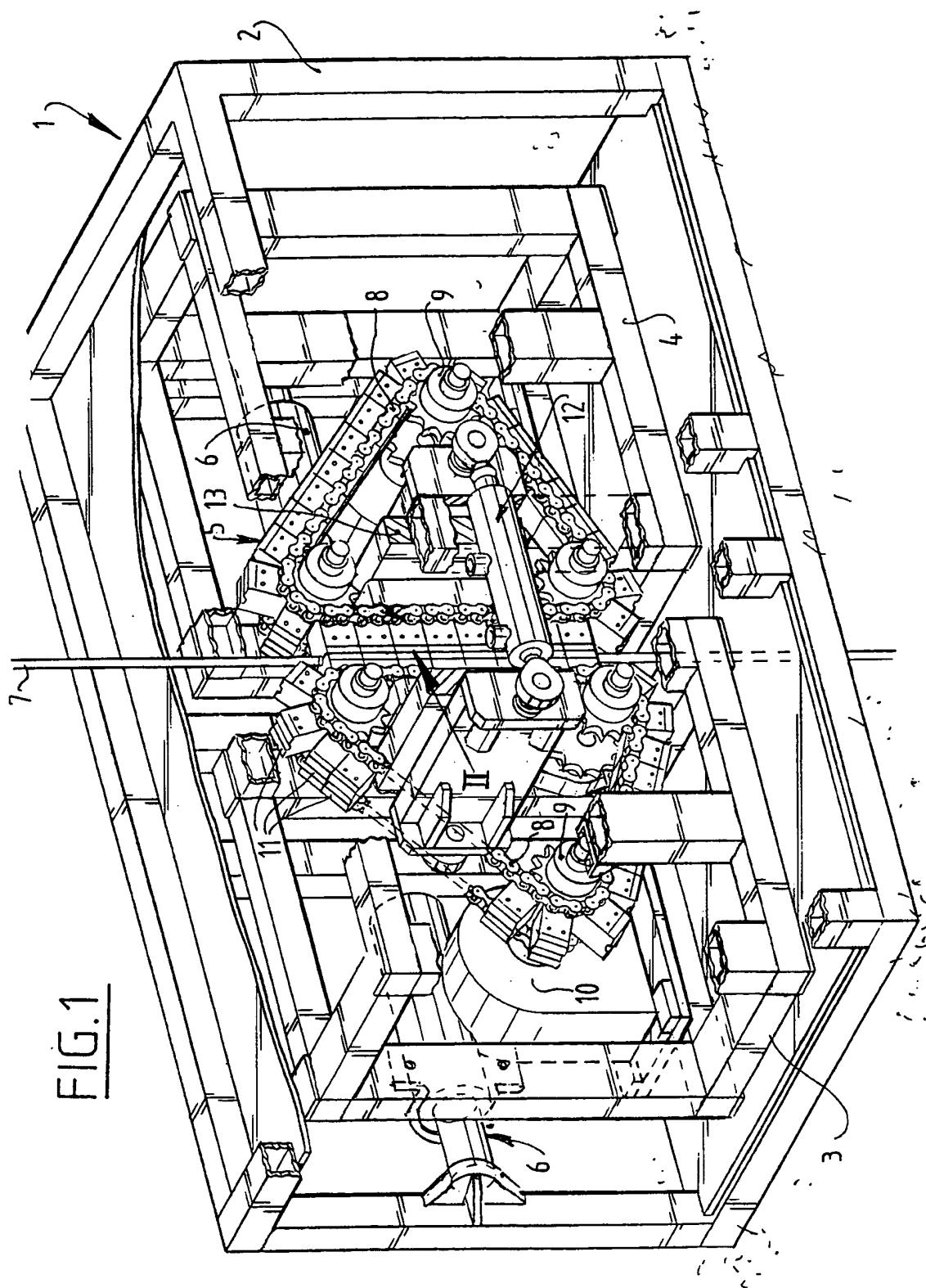
A further possible application is in the arranging of a bore under a dike body. Using the device a 30 cable can first be placed through the dike body and a drill attached to the end thereof. By driving the drill on one side and pulling it through the dike body with the cable the drill can be arranged in very rapid manner.

CLAIMS

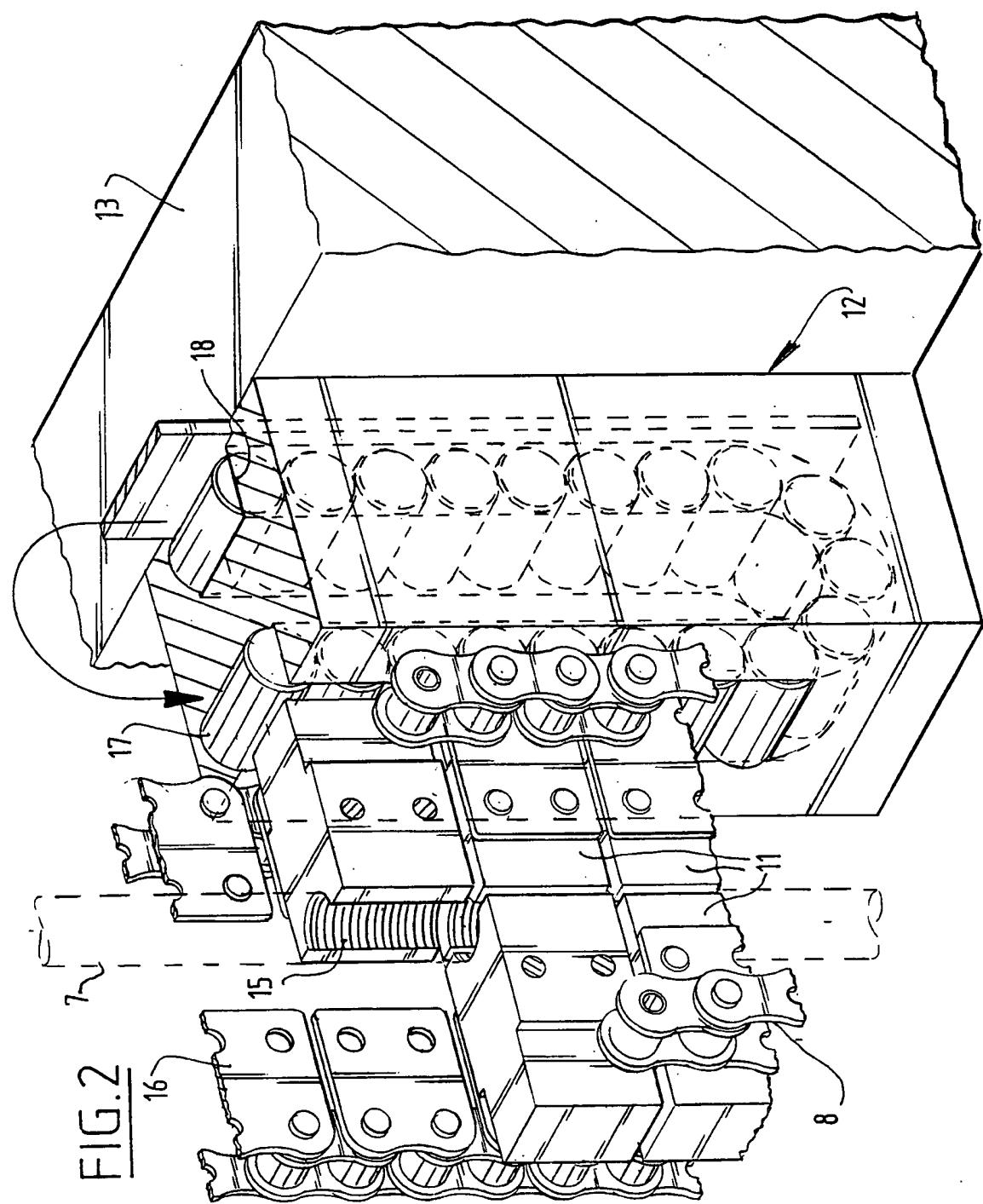
1. Device for driving a rigid elongate element such as a rod or tube in its longitudinal direction, comprising a frame, at least two engaging systems arranged on the frame which each comprise an endless flexible member provided with engaging elements and guide means for guiding each of the endless members, wherein the guide means of each system are arranged such that they define a part of the endless flexible member in which the engaging elements co-act with those in a corresponding co-acting part of another system, and drive means for driving at least one of the endless members.
2. Device as claimed in claim 1, wherein urging means are arranged to urge the co-acting parts toward each other.
3. Device as claimed in claim 1 or 2, wherein the urging means have a stationary disposition in lengthwise direction of the parts.
4. Device as claimed in claim 3, wherein the urging means guide the parts in sliding manner.
5. Device as claimed in claim 3, wherein the urging means comprise guide rollers for the parts.
6. Device as claimed in claim 5, wherein the guide rollers are arranged in a circuit.
7. Device as claimed in any of the foregoing claims, wherein the engaging elements of at least one flexible member are provided with a recess such that the recesses of the engaging elements in the co-acting parts form a channel for receiving the rigid elongate element.
8. Device as claimed in claim 7, wherein the recess is provided with transverse grooves.
9. Device as claimed in any of the foregoing claims, wherein the flexible member comprises at least one chain and each link bears an engaging element.
10. Device as claimed in claim 9, wherein the flexible member comprises two chains lying adjacently at

a mutual distance and the engaging elements are arranged between these chains.

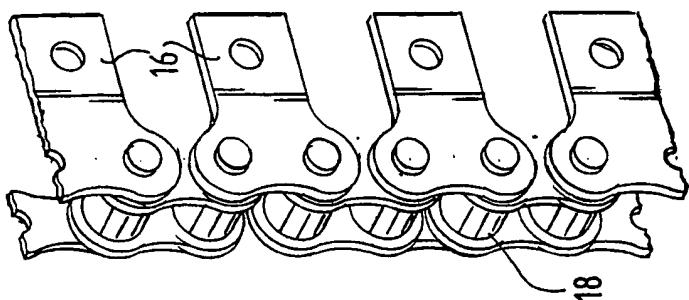
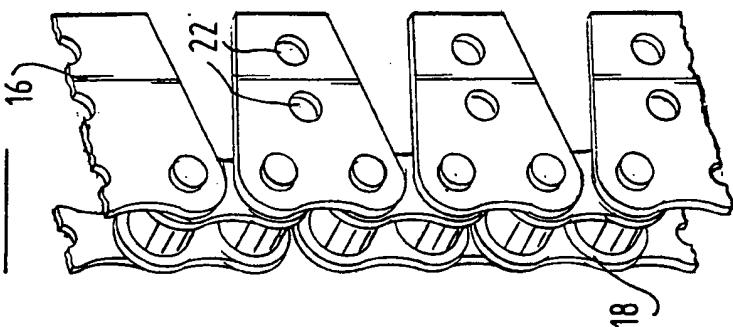
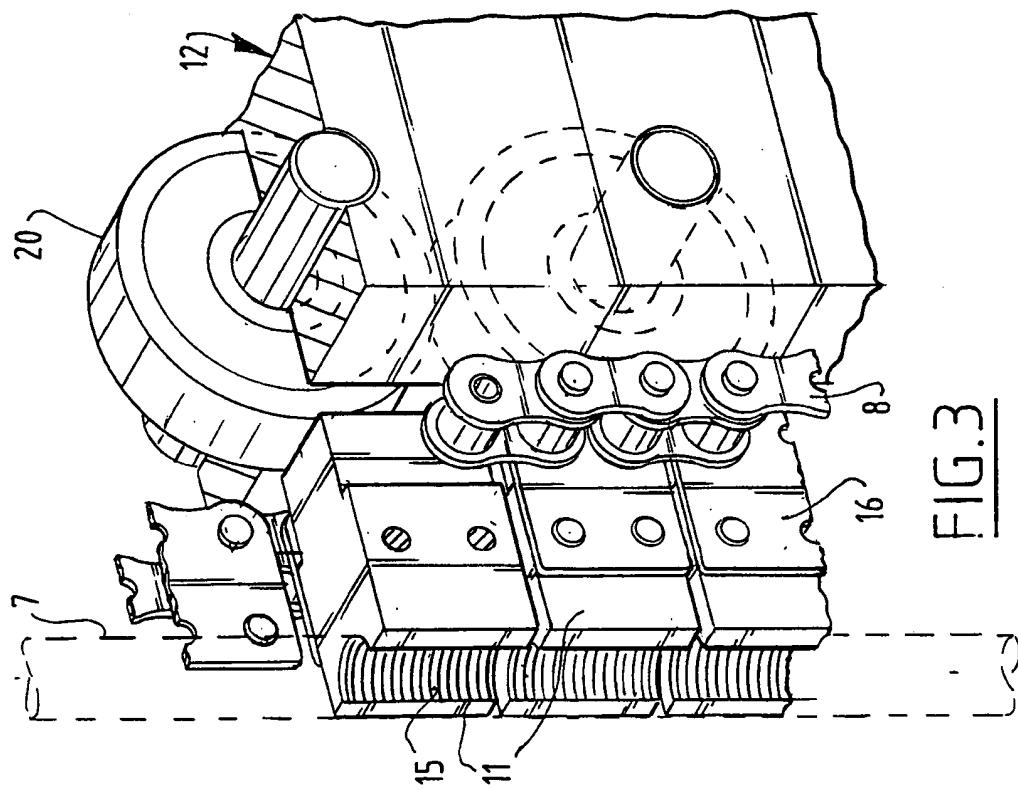
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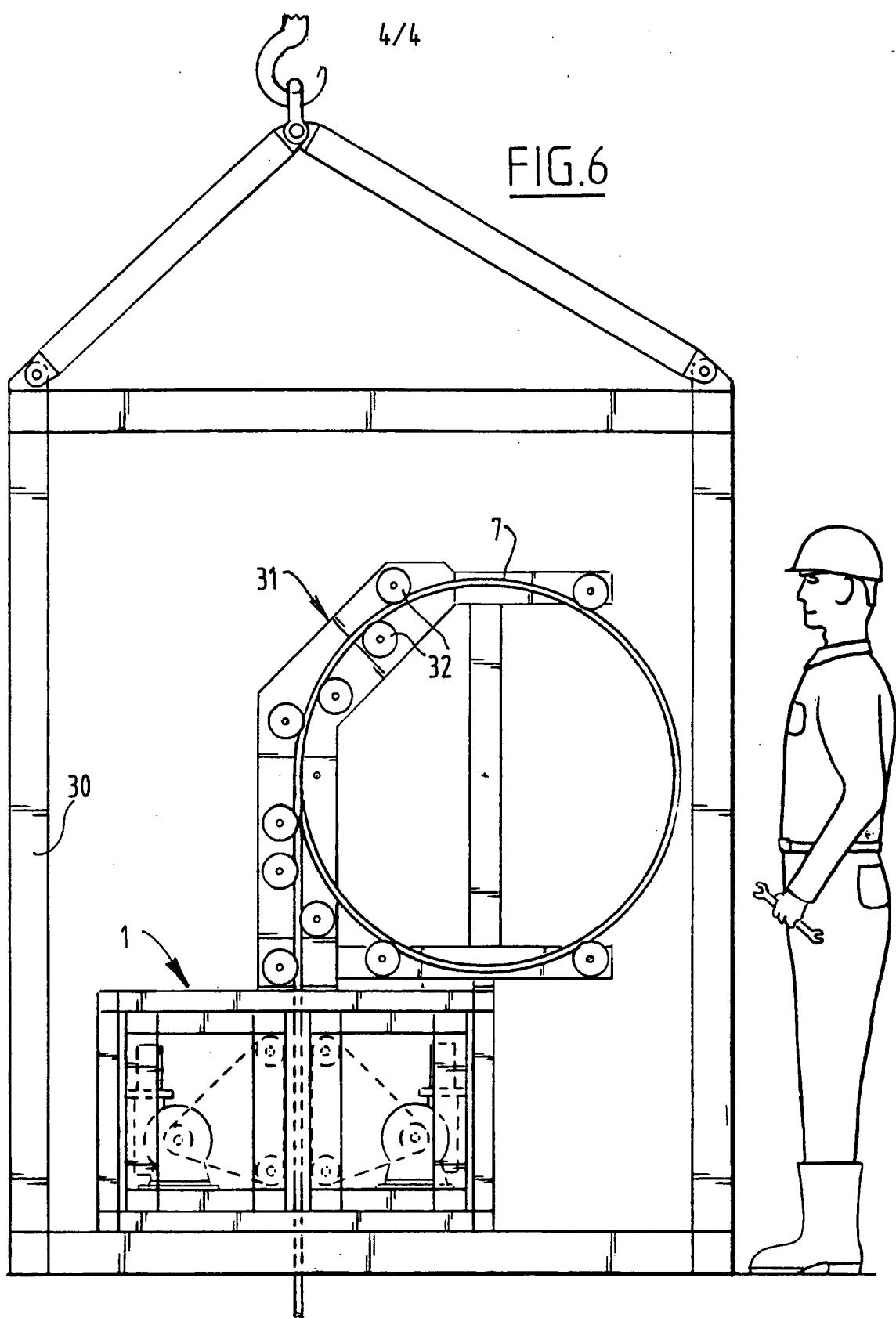
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3/4

FIG.5FIG.4FIG.3

4/4

FIG.6

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00596

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 E21B19/22 B66D3/00 E02D1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E21B B66D E02D

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 775 417 A (COUNCIL MALCOLM N) 7 July 1998 (1998-07-07) column 5, line 44-50 column 6, line 47-51 column 10, line 5-9 figures 2,12 ---	1-10
X	US 4 655 291 A (COX DON C) 7 April 1987 (1987-04-07) column 7, line 1-62 figure 3 ---	1-10
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Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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